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ABSTRACT

The desire to create an effective cost of education index (CEI) arises from a desire to achieve greater equity in state and federal school funding mechanisms. Before such a measure is useful, however, much more thought must be given to the specification of factors differentially affecting demand and supply. Consensus regarding classification of variables must be reached by researchers before sufficient reliability can be attributed to a model to permit its adoption in state aid formulas. More than the areas of transportation and teachers' and administrators' salaries must be included in determining costs before such indices can be utilized. Although ambitious attempts at creating a CEI have been made, they still suffer from some omissions, such as the inability to explain capital expenditures. Perhaps the first application of a successful CEI should not be to adjust state or federal school funding mechanisms but to judge the equity of present expenditures. Development of an acceptable CEI is of utmost importance because without it (1) the thrust of the school finance reform movement will be blunted, (2) federal aid programs cannot recognize differences in costs of compensatory programs, (3) state legislators are reluctant to enact equity provisions, and (4) notions of fiscal equity are impossible to define, investigate, or achieve. (Author/JM)

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THE DESIRABILITY OF APPLYING COST OF EDUCATION INDICES GIVEN THE CURRENT STATE-OF-THE-ART

by

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A Paper Presented at the
Northeastern Educational Research Association
Annual Meeting in Ellenville, New York

October 26, 1979

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1. Introduction

The idea that obtaining the same quality of education in different geographic locations requires differential costs is an old one. (Wasserman, 1963) Despite some fifteen years of effort, including intensive effort over the past five, no completely successful Cost of Education Index (CEI) has been devised. The impetus behind the continued attempts to derive a CEI revolve about notions of equity. Those researchers active in the school finance reform movement wish to adjust per-pupil expenditures for the delivery of equivalent quality educational services to better understand the nature of the large disparities between high and low expenditure school districts. Similarly, extant state and Federal financial aid programs distribute funds without regard to geographic cost differences, often excerbating existing disparities. Until it is possible to ascertain differences in educational cost, it will be impossible to judge the equity of an aid program.

No less important, the equating of purchasing power of school districts may enable educators to understand the implicit policy choices of school districts as they purchase educational goods and services. Perhaps it is that districts with mostly upper-middle class populations purchase different educational quality, or spend their dollars differently than those serving disadvantaged pupils from poor families. Such differences may provide crucial answers that previous studies of school district productivity have not been able to generate.

Conceptually, CEI's involve similar concerns whether they use simplistic indexes or sophisticated economic paradigms. These problems and issues usually revolve about the measurement of quality in education, the removal of standard of living (or desire) from the equation, the allowance for teacher union activity, the relationship to consumer price indexes, the inclusion of educational needs, the specification of variables to be included, the issue of who benefits from the application of such an index, the economy-of-scale and the teacher buying power issues.

The primary distinction to be made is between cost of living and standard of living. Cost of living refers to the prices one must pay for the same quality items. If prices are higher because you require (or desire) a higher quality item, that is considered a change due to the standard of living. Quality in education is an elusive quantity, and determining that one teacher is of higher quality than another usually means utilizing characteristics which are reflected in teacher salary schedules, i.e., degree status and years of experience. Unfortunately, both of these are a function of the tenure system and teacher supply, which tend to artificially affect these surrogates of quality.

A CEI must consider only those factors which relate to cost of living, not standard of living. Economists term these considerations as related to supply rather than demand. At first it would seem that the consumer price index or some other index of cost of living might be utilized. Unfortunately, the cost of living and costs of education are not the same. Attempts to equate the two result in such undesirable side effects as aiding districts with higher per-pupil expenditures, which appear to be a demand factor.

The differentiation of demand from supply is a difficult methodological problem that has not been fully resolved. Although no longer ignored or decided by whim, economists still differ over the classification of some variables or treat the issue with models designed to assess simultaneity of influence.

Attempts at using a consumer price index also raise the question of what this compensates for. Nominally, this appears to be adjusting teacher salaries. That, in turn, raises a question of teacher buying power. Studies indicate that teachers' expenditure patterns differ substantially from the wage earners and clerical workers upon which the Consumer Price Index has been based, although the absolute change may be the same. The weight of evidence, therefore, seems to rule out the simple application of a consumer price index to correct for differences in the cost of education.

A second method of determining education costs is to utilize an economic approach that uses statistical methods such as multiple regression analysis to determine price variation and the determinants of those variations. This approach is termed the market price schedule. The market price schedule also has weaknesses, however. First, such schedules are again influenced by the variables chosen for inclusion, and the reliability with which they have been measured. Second, the market price schedule seldom includes the effects of unions and collective bargaining, or of fringe benefits. Third, traditionally such regression analyses have not included price variations caused by the needs of pupils, or by size of school district. Fourth, use of such analyses results in, at best, 70 percent of the variation in teachers' salaries among districts being explained. Although such a large percentage of unexplained variance is usual in some areas of social science or educational research, it leads a number of critics to conclude that the application of regression is inappropriate to the creation of a CEI.

These problems have led Chambers (1979) to suggest that any CEI must consider "hedonistic" treatment of personnel through differential treatment in salary, fringe benefits, and working conditions. Such an approach demands collection of far more detailed data than has previously been utilized in attempts to create CEI's.

No consistent or agreed upon model or technology has emerged to refute existing objections. Simplistic indexes, such as that utilized in Florida, have had an unfortunate tendency to shift state aid in unexpected and undesirable directions. The complexity and disagreement over the more sophisticated models have prevented their adoption by state legislatures or state and Federal agencies. The enormity of data collection required by the Chamber's model seems to limit its effectiveness and possible adoption. Thus, the current state of the art seems to preclude applying current CEI's until they reach a more refined state.

This article discusses the need for a CEI and the justification of continued work on such an index, examines existing education cost indices and their

shortcomings, discusses some of the conceptual difficulties that must be considered when constructing a CEI and how latest attempts to build a CEI have met those concerns, and explores the desirability of attaining an accurate, utilitarian measure of the cost of the same quality of education. Finally, the article delves into the pragmatic policy issues that arise with attempted application even if one has successfully dealt with methodological and conceptual concerns in the construction of a CEI.

2. Justification for a Cost of Education Index

The original attempts to devise a Cost of Education Index were undertaken by school business administrators whose interest was solely to determine the extent to which various portions of the budget were being adjusted for inflation. (Furno, 1971) With the advent of collective bargaining, there was renewed interest in regional differentiation between salaries so that boards of education could more accurately ascertain competitive counteroffers during teacher negotiations. Recently interest has been revived in such measures because of the advent of the school finance reform movement, and its concern with fiscal equity (Chambers, 1978). Because the finance reform movement has invoked the interest of those in several academic disciplines outside of education, particularly economists, the latest attempts involve the application of sophisticated econometric models to devise a CEI.

It is this renewed concern on the part of school finance scholars which provides the best justification for the continued effort to obtain a CEI. The goals of the school finance reform movement have been to divorce per pupil expenditures from local school district property wealth (fiscal equity or fiscal neutrality) by raising revenue in an equitable manner and to distribute these state and local educational resources in a way that guarantees equality of educational opportunity and equal quality of education for all students in a state (student equity) (Coertz, et. al., 1978). To assure equal educational opportunity, it is necessary to assess the differences that school districts must pay for quality-equivalent services.

Further, if one is able to measure differences in school districts' efforts to obtain quality-equivalent services, it may be possible to

design state and federal aid programs which compensate for higher costs incurred by a district. Currently most state and federal aid program interventions ignore cost-related differences while requiring service equivalence (e.g., the 'Education of All Handicapped Act of 1975'). Although certain aid programs are designed to create aid because of the alleged extra expense of educating certain types of children (e.g., Title I funds), the measures used to award such aid depend upon surrogate measures (e.g., high proportions of impoverished children residing in the school district). This has unintended effects. In urban states, federal aid goes to central cities, but in those states with a moderate degree of urbanization, all districts profit, while in the least urbanized states, federal aid goes to rural areas. It is unlikely that higher costs of education also follow this pattern. Further, the Title I formula is sensitive to the relative position of the urban area's income. Albany, New York, which is poorer than its state's average income, received $189 per pupil in Title I aid, while Jackson, Mississippi, which is somewhat wealthier in income to its state average, received only $40 per pupil in 1976 (Berke, 1976).

As will be described below, existing 'Cost-of-Living' adjustments that have been appended to state aid formulas (e.g., Florida, New Mexico) have not successfully captured costs of education, and have had such untoward effects as running counter to the equalization intentions of the state aid formula. The failures, however, provide further impetous for attempts to obtain a workable mechanism.

Certainly the ability to directly compare spending for educational services is a crucial development in the utility of data bases for policy analysis. At the present time, it is simply

impossible to know whether current expenditures per pupil in Chicago ($1,491) buy the same quality of education as New York City ($2,507), which spent 23 percent more per child in the same year (Brazer and Anderson, 1975). Data bases currently collected to assess progress toward fiscal neutrality and reduction of expenditure disparities (e.g., ELSEGIS finance) are unable to inform differences in the cost of education by region for equivalent services. This limitation severely limits studies purporting to measure the national cost of equalization or degrees of expenditure disparity reduction (Brown, et. al., 1978).

Perhaps the most promising justification for continued efforts to obtain a CEI lies in a relatively obscure point raised by Chambers (1978) and expanded by Fowler and Wiley (1978). Current CEI's employ state average percentages of such budget components as teachers, administrators, transportation, and the remainder of the budget in order to calculate the overall cost index. However, the equating of purchasing power of school districts might enable educators to understand the implicit policy choices of school districts as they purchase educational goods and services. These policy choices may be the result of differences in technology, or taste, or greater education efficiency and effectiveness. Perhaps it is that districts with mostly upper middle class populations purchase different educational quality or spend their dollars differently, (and more effectively) than those serving disadvantaged pupils from poor families. Knowledge of these differences will not only lead to superior cost of education indices, but also to a better knowledge of school effectiveness.

3. Attempted Applications of a CEI

A CEI is intended to identify prices and price differences that school districts incur when purchasing the same quantity and quality of education. Typically, CEI's measure the variance from a statewide average to purchase a given quality of education. Particularly of interest are those costs that are beyond the ability of the local board to control. Two basic approaches abound: the first assumes that differences in educational costs mirror differences in the cost of living, and utilize the consumer price index or some variant of it; the second uses an econometric approach called the market price schedule statistically determining the factors causing price variation. Those price determinants not related to differences in quality are then utilized to assess cost differences.

To date, no state has employed the latter methodology, although such a theoretical construct was created for Missouri, Michigan, Indiana, and Florida. Three states, Florida, Utah, and New Mexico, have enacted some form of a CEI index, with Florida's being closest to a consumer price index. The spectacular failure of the Florida mechanism deserves further discussion.

In 1973, the Florida State Legislature enacted a comprehensive new state school funding system, of which one component was a cost-of-living index. It provided that counties with higher than average estimated price levels would receive proportionately higher per-pupil shares of state revenues (Kenny et al., 1975). The intent of the Act was to guarantee that each county school district could use its state aid to purchase the same level of per-pupil educational services as another county, irrespective of the cost of differences between counties. To accomplish this, a cost-of-living factor (COLF) was devised for counties which ranged from 90 percent to 110 percent of the state average per-pupil allotment. For example, if the average per-pupil state aid was to be $575.00, a county with the highest cost-of-living factor would receive 110 percent of $575.00, or $632.00 per child.

To develop the COLF, 12 of 67 counties were chosen for comparison purposes, and data were collected on the cost of 112 items. Differences in prices for goods, housing, apparel, transportation, and personal services (including health and recreation), were reported to create the COLF for each county. The COLF was then based upon the pricing differences of a representative 'market basket' of goods and services, using methodology similar to the manner in which the Bureau of Labor Statistics computes the consumer price index (CPI).

However, analysis of the operation of the COLF conclusively demonstrated that its effect was precisely the opposite of that intended: that is, the COLF gives a higher index to wealthy school districts than poor ones, and so the more a district spends, the more state aid it receives. Thus, the COLF provided dis-equalizing aid in an otherwise equalizing state aid formula. Rather than achieving the equality of opportunity sought by the legislature, this correction enabled wealthy, high expenditure, districts to increase their quality of goods and services (Johns, 1974).

The failure of Florida's COLF was primarily due to the erroneous assumption that consumer prices and education prices correspond closely. With a few exceptions, such as gasoline and heating oil costs, school districts' cost determinants are not the same as those entering a consumer price index equation. However, even if there were a one-to-one correspondence between a CPI and a CEI, the COLF contained two other flaws. First, the COLF devised no mechanism for controlling for the purchase of higher quality of goods and services. Rather, these were translated into higher costs. Thus, a school district choosing to employ higher educated, more experienced teachers was rewarded for an increase in educational quality (assuming for the moment that these attributes are related to higher educational quality). Second, there was no consideration of factors other than cost which might affect demand, such as the relative desirability of living and working in the district. Such endogenous factors create higher costs to provide the same quality of education, but were not recognized by the COLF.

In 1974 the New Mexico Legislature passed a new school funding law with a provision that was intended to aid school districts that recruited a more experienced or better teaching staff, in an effort to help districts upgrade the quality of education in their schools. This feature might almost be termed a 'quality of education' index, designed to accomplish much of what the Florida COLF did by accident (although not essentially for the wealthy districts). A weighted index was computed for each district based on five categories for training and experience. In addition, a 'cellar' or floor value was given to districts with low resulting values to protect those who had traditionally hired larger numbers of beginning teachers (Hale, 1976).

But even New Mexico's 'quality index' performed badly. The correction gave school districts a fiscal incentive with which they could control state aid, rather than adjusting quality. Districts that simply released non-tenured teachers and permitted their staffs to mature in experience or allowed in-service credit in-lieu-of university awarded degrees for horizontal salary guide movement were rewarded with additional state aid, the same as districts striving for higher quality staffs.

The failure of these simplistic indexes to achieve desirable or intended effects has created greater reluctance on the part of legislators to attach a CEI to state aid formulas. It provides even a greater obstacle to the acceptance of econometric modeling, which may prove the best opportunity for devising a CEI.

4. Conceptual Concerns in Constructing a CEI

The early business administrators who attempted to look at the question of constructing a CEI confused costs and expenditures. Recent application of economic theory and methodology have enabled researchers to more adequately resolve this issue, however, disputes remain. The ability to separate costs from expenditures requires holding constant differences in quality. Quality in education is an elusive quantity, and determining that one teacher is of higher quality than another has usually meant utilizing characteristics which are reflected in teacher salary schedules, i.e., degree status and years of experience. Unfortunately, both of these are a function of the tenure system and teacher supply, which tend to artifically affect these surrogates of quality. Some economists even assert that once a wage scale has been set and teachers hired, the quality measures are irrevant, as they are no longer controlled by the school district (Brazer and Anderson, 1975).

Conceptually, a CEI must reflect only those factors which relate to cost of living, not standard of living. Economists categorize these considerations as related only to supply rather than demand. At first it would seem that the consumer price index or some other index of cost-of-living might be utilized. Unfortunately, the cost-of-living and costs of education are not the same. Attempts to equate the two result in such undesirable side effects as aiding districts with higher per pupil expenditures because they employ more highly trained or experienced teachers which appear to reflect a demand factor (Johns, 1974).

Using a consumer price index also raises the question of what this compensates for. Nominally, this appears to be intended to adjust teacher salaries for cost-of-living differentials. This in turn raises a question of teacher buying power. Studies indicate that teachers'

expenditure patterns differ substantially from the wage earners and clerical workers upon which the Consumer Price Index is based, although percentage changes, over time, in living costs may be the same (McDonald, 1952). Also, evidence exists to indicate that teachers neither live nor purchase goods in the areas in which they teach (McDonald, 1952; Wood, 1974). Although some argue that teachers should be compensated with 'battle pay' to induce them to work in less desirable school districts, existing empirical research seems to indicate that, currently, such stipends for teaching poor, minority students do not actually occur (Brazer in Michigan, 1975; Grubb in California, 1975).

If teachers receive additional pay in one district with high costs, but reside elsewhere, they may, after accounting higher transportation expenses, be able to maintain a higher standard of living, creating an incentive to work in that district. Further, this windfall, and any CPI correction applied to education, tends to unfairly benefit districts where consumer 'market basket' prices for food, clothing, etc., are high, regardless of whether or not educational costs for teachers and materials are high. One interesting anomaly of high CPI school districts is that the working conditions at such schools are usually superior, that is, teachers enjoy low teacher-pupil ratios, high socioeconomic clientele, fine facilities, and a wealthy tax base, so that issues of over-correction or incentive arise. The weight of evidence, therefore, seems to rule out the simple application of a consumer price index to correct for differences in the costs of education.

A second method of determining education costs is to utilize an economic approach that uses statistical methods such as multiple regression analysis to determine price variation and the determinants of those variations. Only those price determinants which relate to true

costs, i.e., to supply rather than demand, are then used in constructing the cost-of-education index. This approach is termed the market price schedule. The market price schedule also has weaknesses, however. First, such schedules are influenced by the variables chosen for inclusion, and the reliability with which they have been measured. There is also scientific and political controversy over the selection and classification of such variables.

For example, the inclusion of income in a measure of the wealth of a school district radically changes the relative standing of such a district in comparison to is property-wealth value (Odden, 1976), yet the school district seldom has access to such wealth to convert it into revenue. Also, the market price schedule has seldom included fringe benefits and the approach has difficulty dealing with the effects of unions and collective bargaining. Brazer (1975) attempted to measure union strength by the number of days that teachers were on strike in a district during 1970-72, and the provision in a district's union contract for an agency shop and binding arbitration. Unfortunately, the latter measures may not be a result of recent pressure, nor do the above reflect lesser degrees of union activity, such as reaching impasses, work slowdowns, or filing of grievances. Although the effects of collective negotiations present extremely difficult conceptual and measurement problems, the exclusion of fringe benefits from salary-based regression models is almost inexcusable, as these additional compensations may cumulate to 25 percent of teachers' salaries. Traditionally, such regression analyses have not included other sources or concomitants of price variations such as the 'needs' of pupils (e.g., handicapped, disadvantaged), or size of school district (Chambers, 1976), although these factors again raise serious supply-demand questions.

A distinct problem is that such analyses usually account, at best, for 70 percent of the total district variation in average or aggregate teachers' salaries. Although such a large percentage of unexplained variance is neither uncommon nor taken to be indicative of great invalidity in some areas of social science or educational research, it has led a number of critics to conclude that this particular methodology is inappropriate to the creation of a CEI.

The specification of factors differentially affecting demand and supply is a difficult substantive problem that has not been fully resolved. Economists studying educational costs profoundly differ over the classification of some characteristics of districts and communities and their influence upon costs. For example, Brazer and Anderson (1975) and Grubb (1975) treat tax base as demand-related, while Kenny, et al. (1975) believes that a district's tax base is supply-related.

Brazen and Anderson (1975) comment:

> "We cannot offer a sophisticated model of demand for teachers that looks like the 'real world.' What we can do, however, is make some intelligent guesses about the nature of that demand and the factors that are likely to influence it."

Their "intelligent guesses" include:

1. The lower the salary, the more teachers a district will want to hire.
2. Education is a 'normal good' for which consumption rises as income goes up.
3. Taste or preference for education may influence demand.
4. The number of teachers employed and the number of pupils in the district is independent.

5. Teachers are paid less, with other things equal, when achievement scores are high.

Prior to the entry of economists into CEI related studies, no clear differentiation was made between demand (quality related) and supply (cost) variables. Either such concerns were ignored (as in Furno), or decided arbitrarily. At least four studies have utilized an economic approach to the creation of CEI's. The first such approach by Brazer (1975) still decided classifications arbitrarily. Frey (1976), however, did successfully differentiate these variables, although his work was a cost of teacher index, rather than a cost of education index. His major discovery was that teachers' salaries were determined by the wages paid in the labor market for jobs requiring similar training. Further research on the differential cost of education permitted Grubb (1975) to delineate a model which separated supply and demand factors. His work was one of the most complete, although even it lacks the effects of seniority, tenure, and teacher immobility. Chambers, et al. (1976) extended Grubb's work, using data from Missouri. Although Chambers adjusted his CEI with measures of union activity, pupil need, and economy of scale, he neglected teacher immobility and seniority provisions.

5. Examples of These Methods

Brief examples of two methods, a simple index and an economic model, are illustrative of some of the conceptual difficulties that are encountered by those seeking to construct a CEI. Furno (1971) published a cost-of-education index from 1961 to 1971 that utilized the results of budget reports from 1,181 school districts for each two-year period. He attempted to subdivide cost increases into inflationary and non-inflationary components. The logic of the procedure was to assess category-specific increases in each budget category, according to supply or inflation, and thus eliminate components of cost increase due to shifts in the proportion of funds expended on particular categories. In addition, he grouped districts by grade level, organization, wealth, region, district size, and expenditure level per child. Using this system, he obtained an average cost per-pupil unit value (EPU) by type of district and region.

However, this indexing system cannot hold constant differences in quality of items purchased (demand). As a result, even after removal of inflation increases, the Furno index still reflects expenditures, not costs.

Economically oriented research workers express the results of their adjustments as an index, but use more complex mathematical procedures to derive them. Typically, least squares regression is utilized to determine those variables that influence supply (costs). Because demand and supply are functionally related to distinctive, but potentially overlapping, sets of causal factors, Fowler and Wiley (1978) have recommended the use of two-stage least-square regression models (as in Brazer and Anderson, 1975) in comparison to the use of single least-square regression models which cannot assess simultaneity of influence (as in Chambers).

Johnson (1978) describes Brazer's methodology in creating a teacher cost index:

> "1. Demand and supply functions are set out which indicate the relationship between teacher salaries and certain factors thought to influence what school districts are willing to pay teachers (the demand function) and certain other salary related factors thought to influence what teachers are willing to offer their services for (the supply function).

2. The demand and supply functions are then put into reduced form to become a single equation, reflecting the relationship between teacher salaries and demand and supply factors.

3. Actual school district data is then used (that represent teacher salaries, demand factors and supply factors) to statistically estimate the various parameters of the reduced form equation, using multiple regression analysis.

4. Once the reduced form equation has been statistically analyzed and parameter estimates for each of the factors in the equation have been obtained, an "estimated" teacher salary for each school district in the study is calculated by plugging in school district mean values for the demand factors and actual school district values for the supply factors. Multiplying each of the parameter estimates (regression coefficients) times these demand and supply factor values yields an estimated teacher salary value.

5. This estimated teacher salary value is then compared to an average or the mean school district teacher salary value which is calculated using the same reduced form equation and regression coefficients. However, to arrive at the mean teacher salary figure, mean school district values are plugged in to both demand and supply factors (all the variables in the equation).

6. The final step in calculating an index value for a specific school district is to form a ratio, with the estimated school district teacher salary value in the numerator and the mean teacher salary value in the denominator."

Brazer and Anderson (1975) utilized a 2SLS regression technique to allow for simultaneity of influence. They drew a sample of 173 K-12 school districts in Michigan, drawn from the 530 K-12 school districts in the state. Table I displays the results of their regression runs.

Johnson (1978) raises several objections to these results. First, correlation tables are seldom displayed for such data, making uncertain the signs obtained. Second, the results suggest that seven of the eleven explanatory variables are statistically significant at the .10 level or better. However, if a 'rule of thumb' commonly applied in econometric research is used, that is, that the regression coefficient value be at least four times the value of the standard error of the regression coefficient to have any degree of confidence in the estimated regression coefficient representing the true unknown population parameter, then only five of the eleven coefficients pass the test. Third, the R^2 of 54 percent indicate 46% of the variation in the average demand price of teachers is unexplained.

TABLE I

REGRESSION RESULTS, DEMAND EQUATION FOR AVERAGE TEACHERS' SALARIES (ATS) IN 173 MICHIGAN K-12 SCHOOL DISTRICTS, 1972-73

Predictor Variables	Regression Coefficient	Standard Error	't' Statistic	Mean (unweighted)
Constant	15,517***	2700	5.75	---
TPUP[ab]	-294.4***	56.81	-5.18	44.14
MILLV[b]	387.1***	52.04	7.44	16.32
PPUPOP	69.27*	36.65	1.89	25.51
PFOR	33.32*	17.56	1.90	17.50
MOB	24.12	15.63	1.54	55.78
PCOL	52.68**	21.44	2.46	18.84
PRICH	-28.10	17.80	-1.58	26.54
SEVP	.3051***	.0451	6.76	20,249
TAXO	-13.31	16.69	-0.80	22.78
RES	-8.720	9.383	-0.93	48.89
REVPL	-116.3***	24.94	-4.67	55.31
				ATS 11,800

R^2 = .54

S.E. = 1265

σ = 1479

N = 173 (sample size)

* Significant at p .10
** Significant at p .05
*** Significant at p .01

[a]Teachers per 1,000 pupils

[b]Endogenous variables

[+]Reproduced from Brazer and Anderson, op cit, p. 53.

Chambers (1978) obtains a cost index for district j by the following formula which was obtained by utilizing regression runs to determine which factors influenced teachers' salaries, administrators' salaries, or transportation costs:

$$\text{COST INDEX} = (.6353*\text{TSALINDEX}) + (.0856*\text{ASALINDEX}) + (.0517*\text{TRANINDEX}) + .2274$$

where

TSALINDEX = a given district's teachers' salary index

ASALINDEX = a given district's administrators' salary index

TRANINDEX = a given district's transportation expenditures index

The weights obtained for each category of school personnel and the transportation cost index are the respective proportion of the average school district budget in the state (here, Missouri) that is allocated to each expenditure category. The .2274 is included to account for the remainder of the school district budget for which no separate index of cost variation was calculated. This is simply an application of the concept of a standard 'market basket' to the purchase of school inputs. The implication is that the quantity and quality characteristics of school services are held constant to determine cost variations associated with supply factors.

To obtain estimates of teachers' and administrators' salaries, data on educational preparation, years of experience, job description, sex, number of class hours per week, and whether or not the teacher was confined to geographic location by spouse's employment was utilized. In addition, income of families in the district, price per acre of agricultural land (as a proxy for the base price of land), the number of districts per square mile in the labor market (as a proxy for monopsony), population density (as a proxy for amenities and disamenities of urban areas), and pupil composition were included in the equation. Existence of formal collective bargaining provisions was also considered. Overall, these measures explained 85 percent of the variance in teachers' salaries.

Variables included in the transportation estimates explained 95 percent of the variance in transportation expenditures. Percent of urban population, pupil density, weather conditions (such as snowfall), numbers of pupils were significant variables considered.

The index, of course, does not account for variations in the prices of other than teachers, administrators, and transportation, although this represents a significant proportion of the total local school district budget. The resulting index ranged from .0785 to 1.196. Thus, the lowest cost districts pay some 21.5 less, while the highest pay 19.6 percent more than the average district to provide a given level of personnel and transportation.

Because administrators' costs tend to exhibit a wider variation than teachers' costs, the variance in the index is widened by their inclusion. However, transportation costs reduce the variation, and are negatively correlated with teacher and administrator salary indices (-.56 in both cases).

Levels of aid are simply multiplied by this cost index for each district to adjust aid. The analysis of teacher supply and demand resulting from the application of these traditional economic concepts, implemented using relatively complex econometric models, is not substantively compelling, however. Severe conceptual problems remain.

Chambers' latest formulation, a hedonic wage index (1979), attempts to sidestep existing models and attend to the causes of differential rates of pay among employees within a given system. Chambers has the rather naive notion that during a period of reduction in force, school districts nationally reward some teachers with preferred assignments. Similarly, he assumes in a tight job market that districts of various attractiveness influence individuals to select from a variety of openings. The characteristics he would consider are presented in Table II.

As of the date this is written, Chambers has not demonstrated the application of the model, although it is fully operationalized. However, a number of problems

TABLE II

FRAMEWORK FOR SELECTION OF VARIABLES TO BE INCLUDED IN THE ANALYSIS OF VARIATIONS IN THE SALARIES OF SCHOOL PERSONNEL

A. PERSONAL CHARACTERISTICS

1. Capacity to Perform Assigned Tasks.

   a. Quantity, quality, and the nature of professional training (e.g., degree level, total years of schooling, certification, major field of study, quality of college attended, vintage of degree).

   b. General measures of intellectual ability (e.g., undergraduate grade point average, rank in undergraduate class, verbal and quantitative ability).

   c. Professional experiences (e.g., years employed in present district, total years of experience in present job title, years unemployed since entering career as an educator, tenure, years of experience in other carriers).

   d. Background characteristics, particularly as they relate to the backgrounds of school clientele (both children and their parents) and co-workers and to personal and emotional maturity and experience.

2. Attitudes, Preferences and Characteristics Related to Alternative Job Opportunities.

   a. Background characteristics (e.g., age, sex, race/ethnic background, and family socioeconomic status).

   b. Personal circumstances (e.g., current family status and responsibilities and constraints on labor market mobility related to family status).

B. JOB CHARACTERISTICS

1. Terms and Conditions of Employment.

   a. Job classification and scope of responsibilities (e.g., hours or weeks of work, job title, class sizes for teachers, or school sizes for principals).

   b. Fringe benefits provided by the district (e.g., contributions to insurance plans and paid sick leave).

*Reproduced from Chambers, op cit., (1979) pp. 47-49.

TABLE II (cont.)

2. Quality of the Organizational, Technological, Social and Physical Environment.

   a. Bureaucracy of the organizational unit (e.g., as reflected by school and/or district size).

   b. Pupil abilities and special needs (e.g., as reflected by test scores or the composition of pupils according to physical or mental handicaps, special abilities, age/grade levels, or cultural background).

   c. Match between the individual's capacity and the requirements of the assignment (e.g., the relation between undergraduate training and subject matter being taught, and the match between certain individual background characteristics and the background characteristics of pupils, parents, and other school personnel).

   d. The quality of support services and facilities (e.g., access to professional or clerical support, access to instructional materials, and age or condition of school buildings).

   e. Safety of the place of work (e.g., as measured by overall crime or assault rates within municipalities connected with school attendance areas).

C. REGIONAL CHARACTERISTICS

1. Condition and Structure of the Labor Market.

   a. Competitiveness of the labor market (e.g., density of school districts, proportion of the market accounted for by the largest district in the region, relative market power of the individual district, and size and density of the region as a proxy for competitiveness of other related labor markets).

   b. Availability of labor market opportunities for the individuals or their spouses (e.g., as reflected by the rate of unemployment in the region and region size).

   c. Degree of surplus in the market for teachers (e.g., as reflected by the ratio of job applications to new hires for teaching personnel in the region or district).

2. Dimensions of the Quality of Life.

   a. Cost of living as proxied by region size, density, degree of urbanization, and land and housing costs in the region in which the district is located.

*Reproduced from Chambers, op cit., (1979) pp. 47-49.

TABLE II (cont.)

b. Access to urban areas (e.g., commuting distances to local employment centers and travel times from non-metropolitan counties to the nearest major central city).

c. Access to consumption opportunities and medical facilities (e.g., retail and service trade establishments and hospitals per square mile and per capita in the region).

d. Access to recreational facilities (e.g., acres of state and national parks, historical monuments and related facilities within given driving distances or times).

e. Climatic conditions and air quality (e.g., average or maximum summer or winter temperatures, annual rainfall or snowfall, percent of days with primary or secondary violations of air quality standards in the region).

*Reproduced from Chambers, op cit., (1979) pp. 47-49.

remain to be resolved. For example, Chambers acknowledges:

> "Unfortunately, the hedonic wage equation provides no information as to the extent that observed relations between wages and job or personal characteristics reflect the results of constraints imposed by the existence of lockstep salary schedules."

6. Remaining Issues

At the heart of the problem of constructing an adequate cost-of-education index is the lack of any cohesive knowledge and theoretical specification of demand. Little is known about why districts choose to prefer a higher quality of education and to what district characteristics this choice is related. Nor is it clear in this period of teacher surplus of the ways in which districts set priorities in teacher hiring and replacement of attrition. Even less is known about the means by which potential district employees come to know about employment opportunities and whether or not they choose to take advantage of them. As a result, it is difficult to make sense of the almost totally arbitrary specifications incorporated into the regression models used to analyze empirical data.

A second flaw is acknowledged by Chambers (1978), when he states that it may not be appropriate to apply a constant budget weight (i.e., of the average district) to salary and transportation indices in order to calculate the overall cost index. However, he states that this was done because no data was available to examine other district choices. As pointed out by Fowler and Wiley (1978) district preferences might be expected to be different even in the face of similar market conditions for two districts.

If, in fact, district preferences will control expenditure profiles, then there is no reason to believe addition revenue, even in the form of cost-compensation, will influence that pattern of preference. Indeed, those that assert that the New Jersey Public School Act of 1975 failed because low expenditure districts chose to lower their tax rates rather than increase expenditures may have found the first evidence in support of this notion (Goertz, 1978). If, indeed, school districts have

preference profiles which differ from cost profiles, then cost of education indices will have to be more sensitive to differences in the average districts' percentage of budget allocation and those of urban and rural profiles, and how those profiles compare vis-a-vis preference profiles. If service profiles implicit in a CEI emphasize one preference relative to another or average them in an unknown fashion, then differential benefits will accrue to districts who reflect similar preferences.

The application of sophisticated econometric techniques has not yielded the anticipated solution in determining cost of education differentials. Perhaps most disappointing is the failure of economists and those who utilize their techniques to arrive at consensus regarding the selection of supply and demand variables, the analysis to be used (two-stage least squares or reduced form equation), the use of sufficiently reliable correlation coefficients for the inclusion of the variables of interest, and the arbitrary dropping of school district manipulable variables (such as union activity measures). Further, the technique is difficult to apply and dependent upon the accuracy of dubious state data, even if consensus were achieved. Finally, to date no attempt has been made to apply the econometric methodology to what might be considered the heart of the matter--per-pupil-expenditures. Instead, the models have been used to adjust state aid formulas.

Even if one has successfully dealt with the above methodological and conceptual concerns, a number of pragmatic policy issues arise with attempted application of such a model. The first difficulty is how to compensate school districts for differential costs. Although it may appear that state aid may simply be adjusted by the composite index, there is seldom a single financial aid program by the state to local

school districts; rather aid is categorical, requiring adjustment of each type of aid. These categorical aids are far from trivial: in Illinois they constitute one-third of all state school aid, most of it running counter to the equalization effects of the 'resource equalizer' general aid formula (Hickrod and Hubbard, 1978). The tendency of categorical aids to subvert the intent of general equalization aids (Goertz, 1978) raises real questions of increasing such aid through the application of a CEI. Second, it is clear there will always be a variety of non-cost-related school district characteristics which may cause variation in teacher supply and teacher salaries. Examples of such non-cost characteristics are size, socioeconomic status, student need, and geographic location. Little is known about these important determinants of the ability of a school district to attract and hold higher quality staff. Third, if the state allocates more money to assume the additional costs of a particular kind, say, higher priced (and presumably higher quality) teachers, it runs a very real risk of providing an incentive for school districts to spend more to receive more state aid. To the extent that the incentive distorts the district's true budget preferences, and to the extent that it creates uncontrollable pass-along costs to the state, such provisions are undesirable. Fourth, there is always that nagging question of who benefits. The disbursement of state funds is seldom a neutral undertaking, and the addition of a cost-of-living provision may distort an otherwise equalized state aid formula, as it has in Florida, by aiding wealthy districts. Particularly questionable is aiding teachers in a district with high living costs, when they reside in other affordable districts. Fifth, there are a variety of school district characteristics which should not affect state aid via teachers' salaries,

i.e., solely through a cost of education index because it would not be considered wise social policy. Examples are the sex composition of the staff, measures of union militancy, and percentage of Black students.

7. Conclusions

The desire to obtain an effective cost of education index arises from a desire to achieve greater equity in current school funding mechanisms employed by the state and federal government, and the goal justifies continued efforts toward the attainment of a utilitarian measure of the cost of the same quality of educational service.

Conceptually, much more thought must be given and effort devoted to the specification of factors differentially affecting demand and supply. Consensus regarding classification of variables must be reached by researchers before sufficient reliability can be attributed to a model to permit its adoption in state aid formulas. Certainly more than the areas of teachers' salaries, administrators' salaries, and transportation must be included in determining costs in a budget before such indices can be utilized. Although more ambitious attempts have been made (Loatman, 1978) they still suffer from some curious omissions, such as an inability to explain capital expenditure costs.

Perhaps the first application of a successful CEI should not be to adjust state or federal school funding mechanisms, but to judge the equity of present expenditure patterns. Successful application to such problems as the cost of equalizing services to achieve equality of educational opportunity might embolden researchers to attempt to discover the implicit policy choices of school districts as they purchase educational goods and services. Only after these achievements, which will inform current models, and improve them, should an attempt be made to adjust school funding formulas with a CEI. Those who wish to achieve funding equity cannot permit the construction of an inadequate device and suffer its uncertain application.

But this does not mean the effort to obtain a pragmatic CEI should

be abandoned, and it seems useful to emphasize the impact of the continued absence of an acceptable CEI. First, until an adequate method of measuring school district expenditures is achieved, the thrust of the school finance reform movement to reduce expenditure disparities will be blunted by the argument that such disparities are in large part the result of differences in the costs of providing equivalent educational services. Second, at the current time, federal aid programs cannot recognize differences in costs for providing compensatory programs. As a result, some students suffer from either exclusion or poorer quality programs because aid provided to their district purchases less. Third, legislators continue to be reluctant to enact CEI provisions unless they believe an adequate measure can be devised. As a result, many state school finance programs suffer from the same flaw as current federal programs. Fourth, witnout an adequate CEI, notions of fiscal equity are impossible to define, investigate, or achieve.

Although the current instruments depart remarkably from the ideal CEI to which we strive, the progress between Furno's (1971) CEI and Chamber's, et al., (1976) is sufficient to be encouraging that the problem is manageable, given adequate time, thought, and resources. The thought of a generation of children who will be deprived of equality of opportunity if we abandon the effort because we believe it unmanageable should be sufficient to spur continued research efforts.

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